JORGE H. TORRES

Current Address:
Office: Department of Bioengineering, U.A. Whitaker College of Engineering, Florida Gulf Coast University, Holmes Hall 313.
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EDUCATION:

Ph.D. in Biomedical Engineering 1991. University of Texas at Austin.
(Electrical Engineering concentration)
Master of Science in Biomedical Engineering 1986. University of Texas at Austin.
(Minor in Electrical Engineering)
Medical Doctor 1981. Universidad Nacional de Colombia (Bogotá, Colombia).

EXPERIENCE:

Associate Professor August 2007 to present
Department of Bioengineering, U.A. Whitaker School of Engineering, Florida Gulf Coast University.
Teaching: Courses: Circuits for Bioengineers, Signals and Systems for Bioengineers, Biomedical Instrumentation, Bioengineering Data Acquisition and Control, Human Physiology, Bioelectricity, Computational Tools for Engineers, Introduction to the Engineering Profession.
Research Projects:
-Detection of hydrophobic organic compounds in water using A.C. Impedance measurements.
-Development of a gas/liquid biosensor for environmental toxins based on a titanium oxide coating.
-Electrochemical inactivation of toxins using a titanium oxide coating as a substrate.
-Biosensor assay development for the rapid detection of marine biotoxins.

Visiting Professor June 2004 – July 2007
Department of Electrical Engineering, University of Los Andes (Bogotá, Colombia).
Activities:
-Teaching: Courses: Biomedical Instrumentation, Biomedical Signal Processing, Medical Equipment Technology, Medical Physiology.
Projects:
-Frenic nerve electrical stimulation to assess diaphragm response in patients in intensive care.
-Non-invasive continuous monitoring of blood pressure.
-Development of a system for real-time visualization, acquisition, and storage of mechanical respiratory parameters such as pulmonary and airway pressures, air flows, and volumes. This system is intended for use in an Intensive Care Unit.
-Development and evaluation of methods for electrocardiogram analysis aimed at defining

electrocardiographic patterns associated with high risk of sudden cardiac death.
-Development of a portable electrocardiographic system for arrhythmic event monitoring and data transmission via internet.
-Development of a system for wireless transmission of real-time electromyographic data during gait, and correlation to limb motion analysis.
- Development of a low cost ambulatory system for detection of peak plantar pressures during walking in patients with insensible foot (phase 2).

Researcher - Faculty Fellow 2002 – May 2004
Department of Mechanical Engineering, Biomedical Engineering Group, University of Los Andes (Bogotá, Colombia).
Activities:
-Work on the electrophysiology and biosignal analysis lines in the Bioengineering Group.
-Assistance in the Master's Program in Biomedical Sciences at the University of Los Andes.
-Teaching: Courses: Biomedical Signal Processing, Medical Physiology.
Main Projects:
-Development of software for analysis of electromyographic data.
-Electromyographic studies in children with muscular dystrophy and cerebral palsy.
-Development of a low cost system for acquisition, storage, and analysis of electrocardio-graphic data.
-Development of a low cost ambulatory system for detection of peak plantar pressures during walking in patients with insensible foot (phase 1).

Visiting Professor 2001 – 2002
Department of Mechanical Engineering, Biomedical Engineering Group, University of Los Andes (Bogotá, Colombia).
Activities:
-Coordinator of engineering activities directed to the optimization of the newly developed Laboratory for Motion Analysis at the Roosevelt Institute of Pediatric Orthopedics (Bogotá).
-Investigation on the feasibility of a mobile gait analysis laboratory using a reduced number of
video-cameras.

Faculty Fellow 2000 - 2001
Department of Bioengineering, Rice University. Projects:
-*In vivo* evaluation of epidermal protection by cryogen spray cooling during high fluence laser irradiation for dermatological applications.
-Experimental modeling of short-time heat transfer through human skin.
-Utilization of optical tweezers for studies of cell receptor-ligand interactions and membrane biomechanics.
-Studies on lymphocyte response to the application of localized mechanical forces.

Post-doctoral Research Associate 1998 - 1999
Department of Bioengineering, Rice University. Project:
-Optimization of surface cooling technique during laser therapy of skin vascular malformations
-Experimental and theoretical studies on the heat transfer mechanisms during surface cooling, involving sapphire contact cooling as well as refrigerant spaying.

Visiting Scholar Summer 1998
Beckman Laser Institute and Medical Clinic, University of California Irvine. Project:
- Development of an experimental skin model for internal temperature measurements during cryogen spray cooling used for epidermal protection in laser irradiation.

Senior Consulting Engineer 1997
Nucleotecnica Ltda. Bogotá, Colombia.
- Consulting on ionizing radiation monitoring and radiation protection.

Visiting Scientist 1994 - 1996
Biomedical Engineering Center, The University of Texas Medical Branch at Galveston.
Medical Ultrasonics Laboratory: 1996. Project:
- 3-D image reconstruction and volume measurement from ultrasonic imaging.

Biomedical Laser and Spectroscopy Laboratory: 1994 - 1995. Projects:
- Design and testing of directional and isotropic diffusing fiber tips for laser therapy.
- Evaluation of electrosurgery devices for tissue coagulation and tissue ablation.

Post-doctoral Fellow 1991-1993
Biomedical Laser and Ultrasonics Program, Biomedical Engineering Center, The University of Texas Medical Branch at Galveston. Research projects:
- Optimization of laser dosimetry for treatment of benign prostatic hyperplasia.
- Real time ultrasound imaging as a feedback during laser irradiation of tissue.

Research Assistant 1986-1991
Biomedical Engineering Department, The University of Texas at Austin. Research projects:
- Thermal response of normal arterial wall and atherosclerotic plaque to laser irradiation.
- Tissue effects of metal probes and sapphire tips designed for contact laser surgery.

Primary Care Physician 1981-1982
Section of Internal Medicine, Neuro-psychiatric Hospital of Sibaté. Bogotá, Colombia.

OTHER PROFESSIONAL ACTIVITIES: Reviewer for manuscripts in: *Applied Optics*, *Lasers in Medical Science*, *Annals of Biomedical Engineering,* and *Journal of Biomedical Optics*. Referee for grant proposal submitted to the U.S. Civilian Research and Development Foundation. Peer-reviewer for evaluation of master's program in Biomedical Sciences at the University of Los Andes, Bogotá, Colombia (2001), and for evaluation of doctoral program in Medical Sciences at Universidad Pontificia Bolivariana, Medellín, Colombia. Referee for several grant proposals submitted to *Colciencias*, Colombia.

PUBLICATIONS:

Torres, J.H., Rosa, V., Sweeney, J, Barreto, P., Barreto J.: Self-cleaning TiO2 sensor for detection of aliphatic and aromatic hydrocarbons. Int. J. Eng. Res. & Tech., Vol. 8, Issue 5, 147-153, May 2019.

Torres, J.H., Gonzalez, R.: Detection of hydrophobic contaminants at water surface by using impedance spectroscopy. Int. J. Eng. Res. & Tech., Vol. 8, Issue 4, 632-638, April 2019.

Penuela, L., Torres, J.H., and Garcia, A.: Implementation and validation of an integrated system to measure parameters of respiratory mechanics aimed at improving patient ventilatory assistance. Int. J. Eng. Res. & Tech., Vol. 3, Issue 2, 951-962, Feb 2014.

Finn, S.T., Strnad, J. A., Barreto, P.D., Fox, M.E., Torres, J., Sweeney, J.D., and Barreto J.C.: A Screening Technique Useful for Testing the Effectiveness of Novel 'Self-Cleaning' Photocatalytic Surfaces. Photochem. and Photobiol. 87:1184-1188, 2011.

Torres, J.H., Sweeney, J.D.: Integrated lecture-lab approach with virtual instrumentation for teaching electrical circuits to bioengineering students. Proceedings of the American Society for Engineering Education Annual Conference and Exposition 2008, Pittsburg, Pennsylvania. (AC 2008-1706)

Torres, J., Villarraga, C., Egel, A., Moreno, B., García, A., Polanía, R.: System for outpatient measurement of plantar pressures. Proceedings Fourth Congress Iberdiscap, February 2006, Vitoria, Brasil.

Anvari, B., Torres, J.H., and McIntyre, B.W.: Regulation of pseudopodia localization in lymphocytes by application of mechanical forces. J. Biomed. Opt., Vol. 9, 865-872, 2004.

Tunnell, J.W., Chang, D.W., Johnston, C., Torres, J.H., Patrick, C.W. Jr., Miller, M.J., Thomsen, S.L., Anvari, B.: Effects of cryogen spray cooling and high radiant exposures on selective vascular injury during laser irradiation of human skin. Ann. Arch. Dermatol., Vol. 139, 743-750, 2003.

Li, Z., Anvari, B, Takashima, M., Brecht, P., Torres, J.H., and Brownell W.E.: Membrane tether formation from outer hair cells with optical tweezers. Biophys. J., Vol. 82, 1386-1395, 2002.

Tunnell, J.W., Torres, J.H., and Anvari, B.: Methodology for estimation of time-dependent surface heat flux due to cryogen spray cooling. Ann. Biomed. Eng., Vol. 30, 19-33, 2002.

Torres, J.H., Tunnell, J.W., Pikkula, B.M., and Anvari, B.: An analysis of heat removal during cryogen spray cooling and effects of simultaneous airflow application. Lasers Surg. Med., Vol. 28, 477-486, 2001.

Pikkula, B.M., Torres, J.H., Tunnell, J.W., and Anvari, B.: Cryogen spray cooling: Effects of droplet size and spray density on heat removal. Lasers Surg. Med., Vol. 28, 103-112, 2001.

Tunnell, J.W., Nelson, J.S., Torres, J.H., and Anvari, B.: Epidermal protection with cryogen spray cooling during high fluence pulsed dye laser irradiation. Lasers Surg. Med., Vol. 27, 373-383, 2000.

Torres, J.H., Nelson, J.S., Tanenbaum, B.S., and Anvari, B.: Skin thermal response to sapphire contact and cryogen spray cooling: A comparative study based on measurements in a skin phantom. SPIE Proc., Vol. 3907, 29-36, 2000.

Torres, J.H., Nelson, J.S., Tanenbaum, B.S., Milner, T.E., Goodman, D. M., and Anvari, B.: Estimation of internal skin temperatures in response to cryogen spray cooling: implications for laser therapy of port wine stains. IEEE J. Special Topics Quant. Elect., Vol. 5, No.4, 1058-1066, 1999.

Torres, J.H., Anvari, B., Tanenbaum, B.S., Milner, T.E., Yu, J.C., and Nelson, J.S.: Internal temperature measurements in response to cryogen spray cooling of a skin phantom. SPIE Proc., Vol. 3590, 11-19, 1999.

Protsenko, D., Torres, J.H., Chakrabarti, P., Bell, B., Orihuela, E., Motamedi, M.: Optical characterization and coagulation performance of side-emitting fiber delivery systems for laser therapy of BPH: a comparative study. Urology, vol. 47, No. 6, 845-850, 1996.

Motamedi, M., Torres, J.H., Orihuela, E., Pow-Sang, M., Cowan, D., and Warren M.M.: Laser photocoagulation of prostate: influence of dosimetry. Lasers in Surgery and Medicine, vol. 17, No. 1, 49-58, 1995.

Royston, D.D., Torres, J.H., Thomsen, S., Sriram, P.S., and Welch, A.J.: Lifetime testing of sapphire and sculpted silica fiber scalpels. Lasers in Surgery and Medicine, vol. 16, No. 2, 189-196, 1995.

Orihuela, E., Motamedi, M., Cammack, J.T., Torres, J.H., Pow-Sang, M., LaHaye, M., Cowan, D., and Warren M.M.: Comparison of thermocoagulation effects of low power, slow heating vs high power, rapid heating Nd:YAG laser regimens in a canine prostate model. Urology, vol. 153, 196-200, 1995.

Torres, J.H., Welch, A.J., Çilesiz, I.F., and Motamedi, M.: Tissue optical property measurements: overestimation of the absorption coefficient with spectrophotometric techniques. Lasers in Surgery and Medicine, vol. 14, No. 3, 249-257, 1994.

Royston, D.D., Torres, J.H., Thomsen, S., Sriram, P.S., and Welch, A.J.: Comparison of the thermal tissue effects produced by aged sapphire and silica hemispherical tips. Lasers in Surgery and Medicine, vol. 14, No. 1, 47-58, 1994.

Anvari, B., Motamedi, M., Torres, J.H., Rastegar, S., and Orihuela, E. Effect of surface irrigation on the thermal response of tissue during laser irradiation. Lasers in Surgery and Medicine, vol. 14, No. 4, 386-395, 1994.

Torres, J.H., Motamedi, M., Pearce, J.A., Welch, A.J.: Experimental evaluation of mathematical models for predicting the thermal response of tissue to laser irradiation. Applied Optics, vol. 32, No. 4, 597-606, 1993.

Jacques, S.L., Rastegar, S., Motamedi, M., Thomsen, S.L., Schwartz, J., Torres, J., and Mannonen, I.: Liver photocoagulation with diode laser (805 nm) vs Nd:YAG laser (1064 nm). Proc. SPIE, vol. 1646, 1992.

Torres, J.H., Springer, T.A., Welch, A.J., and Pearce, J.A.: Limitations of a thermal camera in measuring surface temperature of laser irradiated tissues. Lasers in Surgery and Medicine, vol. 10, No. 6, 510-523, 1990.

Torres, J.H., Motamedi, M., and Welch, A.J.: Disparate absorption of argon laser radiation by fibrous versus fatty plaque: implications for laser angioplasty. Lasers in Surgery and Medicine, vol. 10, No. 2, 149-157, 1990.

Torres, J.H., Ghaffari, S., Welch, A.J.: Laser probe temperature control by measuring the returning infrared radiation. Medical & Biological Engineering & Computing, vol. 28, 1-7, January 1990.

Motamedi, M., LeCarpentier, G.L., Torres, J.H., and Welch, A.J.: "Thermal Analysis of Laser Ablation of Cardiovascular Tissue", in Lasers in Cardiovascular Medicine and Surgery, G.S. Abela, Ed., Kluwer Academic Publishers, Boston, 1990.

Welch, A.J., Torres, J.H., Cheong, W.F.: Laser physics and laser-tissue interaction. Texas Heart Institute Journal, vol. 16, No. 3, 141-149, 1989.

Welch, A.J., Bradley, A.B., Torres, J.H., Motamedi, M., Ghidoni, J.J., Pearce, J.A., Hussein, H., and O'Rourke, R.A.: Laser probe ablation of normal and atherosclerotic human aorta in vitro: a first thermographic and histologic analysis. Circulation, vol. 76, No. 6, 1353-1363, December 1987.

ABSTRACTS AND PRESENTATIONS

Two oral presentations were made at the Florida Annual meeting and Exposition (FAME) of the Florida Local Section of the American Chemical Society that took place in May 9-11, 2013 near Tampa. Presentation titles: "A titanium oxide-based, self-cleaning sensor for hydrophobic toxins" and "Detection of gaseous hydrophobic molecules using a titanium oxide sensor activated by a UV light flash"

One oral presentation was made at the Florida Annual meeting and Exposition (FAME) of the Florida Local Section of the American Chemical Society that took place in May 17-20, 2012 near Tampa. Presentation title: "Titanium oxide-based self-cleaning sensor for the detection of aliphatic petroleum compounds"

Two oral presentations were made at the Florida Annual meeting and Exposition (FAME) of the Florida Local Section of the American Chemical Society that took place in May 12-14, 2011 near Tampa. Presentation titles: "Changes in electrical conductance of titanium oxide photocatalist can be used to quantify the destruction of a model dye target" and "MnO2 and CrO2 dopants drop the electrical conductivity of TiO2 and quench its photocatalytic activity"

Torres, J., Sweeney, J.D., and Barreto, J.C. Effect of ambient humidity on the electrical conductance of a titanium oxide coating being investigated for potential use in biosensors. 26th Southern Biomedical Engineering Conference (SBEC), College Park, Maryland, 2010.

Torres, J., Sweeney, J.D., Barreto, A., Perez, A., and Barreto, J.C. An investigation of the electrical properties of titanium oxide coatings for potential use in biosensors. 25th Southern Biomedical Engineering Conference (SBEC), Miami, Florida, 2009.

Torres, J., Villarraga, C., Egel, A., Moreno, B., García, A., Polanía, R.: Characterization of piezo-resistive sensors for outpatient measurement of plantar pressures. Second Colombian Congress of Bioengineering and Biomedical Engineering, October 2005, Bogotá, Colombia.

Prada, W., Torres, J.: Design and Implementation of a portable electrocardiographic system and data transmission via Internet. XI Iberchip Workshop, March 2005, Salvador de Bahía, Brasil.

Torres, J.H., Mcintyre, B.W., Li, Z., and Anvari, B.: T-lymphocyte morphological response to receptor activation and mechanical force application with optical tweezers. Lasers in Surgery and Medicine. Supplement 13: 3, April 2001.

Torres, J.H. and Anvari, B.: Enhanced and controlled cryogen spray cooling by simultaneous application of airflow. Proceedings of the Gordon Conference on the Use of Lasers in Biology and Medicine, 2000.

Takashima, M., Brownell, W.E., Li, Z., Torres, J.H., Brecht, P., and Anvari, B.: Membrane tether formation from the outer hair cell using optical tweezers. Proceedings of the Gordon Conference on the Use of Lasers in Biology and Medicine, 2000.

Li, Z., Brownell, W.E., Takashima, M., Torres, J.H., Brecht, P., and Anvari, B.: Outer hair cell membrane tension measured by optical tweezers. Abstracts 30th Annual Meeting of the Society for Neuroscience, 2000.

Torres, J.H., Chakrabarti, P., Pow-Sang, M., Orihuela, E., and Motamedi, M.: High power directional diffusing fiber tip for rapid, uniform and deep photocoagulation of prostate. Proceedings of the American Urological Association, vol. 155, Supplement 705A, May 1996.

Motamedi, M., Torres, J.H., Cammack, J.T., Orihuela, E.: Thermodynamics of CW laser irradiation with prostatic tissue: effects of simultaneous cooling on the lesion size. Lasers in Surgery and Medicine. Supplement 5: 64, April 1993.

Anvari, B., Motamedi, M., Torres, J., Huang, R., Rastegar, S., Jacques, S.L.: Optical properties of native and coagulated canine prostate. Lasers in Surgery and Medicine. Supplement 5: 64, April 1993.

Dozier, S., Diven, D., Torres, J., Brysk, M., Sanchez, R., Motamedi, M.: Q-switched alexandrite laser tattoo removal: in vitro human skin model versus guinea pig model. Lasers in Surgery and Medicine. Supplement 5: 53, April 1993.

Motamedi, M., Cammack, J.T., Torres, J.H., Anvari, B., Orihuela, E., Cowan, D., Warren, M.M.: Laser coagulation of prostate: methodology and dosimetry considerations. Lasers in Surgery and Medicine. Supplement 5: 65, April 1993.

Torres, J.H., Motamedi, M., Cammack, J.T., Johnston, A., Hendrix, D.: Application of high frequency ultrasound imaging for monitoring tissue damage during laser irradiation. Tenth Annual Conference on Biomedical Engineering Research in Houston. March 1992.

Cammack, J.T., Motamedi, M., Torres, J.H., Orhuela, E., Warren, M.M.: Response of canine prostate to Nd:YAG laser irradiation: Thermographic analysis and histologic correlation. Tenth Annual Conference on Biomedical Engineering Research in Houston. March 1992.

Anvari, B., Motamedi, M., Rastegar, S., Torres, J.H.: Experimental and theoretical analysis of intraluminal laser heating of tissue. Proceedings of the Society for Opt. and Quant. Elec., 1992.

Torres, J.H., Motamedi, M., Çilesiz, I., Welch, A.J.: Optothermal response of normal arterial tissue to laser irradiation: a theoretical and experimental investigation. Optical Society of America Annual Meeting. Technical Digest Series (17): 43, November 1991.

Welch, A.J., Torres, J.H., Sriram, P.S., Thomsen, S.: Aging of sapphire tips. Lasers in Surg. and Med. Supplement 3: 35, April 1991.

Torres, J.H., Motamedi, M., Welch, A.J.: Effects of the rate of heat deposition on arterial wall during CW laser irradiation. Lasers in Surg. and Med. Supplement 2: 16, April 1990.

Springer, T., Torres, J., Pearce, J.A., Welch, A.J.: Correction of thermal camera inaccuracy using inverse filtering. Lasers in Surg. and Med. Supplement 1:14, April 1989.

Torres, J.H., Welch, A.J. and Ghidoni, J.: Adventitial temperatures and extent of damage during in vitro application of a laser thermal probe to canine arteries. Physics in Med. & Biol. vol. 33, supplement I: 189, August 1988.

Cheong, W.F., Welch, A.J., Thomsen, S., von Eschenbach, A.C., Torres, J.H., Swanson, R.: Comparison of surface temperatures and damage volume in canine bladders during in vivo irradiation at 1.06 μm wavelength. Physics in Med. & Biol. vol. 33, supplement I: 18, August 1988.

Torres, J.H., Springer, T., Welch, A.J., Pearce, J.A., Flake, R.H., Dehel, T., Mazure, P.: An evaluation of the accuracy of a thermal camera in detecting surface temperatures of laser irradiated tissues. Lasers in Surg. and Med. Vol. 8, No. 2: 193. April 1988.

Bradley, B., Welch, A.J., Torres, J.H., Motamedi, M., Ghidoni, J.J., Pearce, J.A., Bayardo, R.J., Hussein, H., O'Rourke, R.A. : Laser probe ablation of normal aorta and plaque: correlation of thermographic and histologic findings. 36th Annual Scientific Session of the American College of Cardiology. New Orleans, March, 1987.

Welch, A.J., Torres, J.H., Bradley, A.B., Motamedi, M., Ghidoni, J.J., Pearce, J.A.: Laser-tissue interaction: propagation of energy through tissue. Third Congress of The European Laser Association. Workshop laser angioplasty with modified fiber tips. Amsterdam, November 1986.

Torres, J.H., Welch, A.J., Motamedi, M.: Effects of laser application to human aorta through metal tipped and naked fibers. Lasers in Surg. and Med. vol. 6, No. 2: 176. May 1986.

Participant in previous funded Grants at Florida Gulf Coast University:

Co- PI in the project "Biosensor Assay Development for the Rapid Detection of Marine Biotoxins" that was awarded as part of the internal Multi-Disciplinary Research Initiative (MDRI) sponsored by the Office of Research and Sponsored Programs at FGCU. The PI and the other co-PI were, respectively, Dr. Mustafa Mujtaba from the Department of Biological Sciences and Dr. Michael Parsons, Director of the Coastal Watershed Institute.

Co-Investigator on Grant from the Department of Defense/Office of Naval Research (DOD/ONR) entitled "Developing Decontamination and Detection Technologies for Biodefense, Biomedical and Environmental Uses," which was funded at $1.2M from

1/02/11 to 8/31/13. Leader of biosensor development tasks within this effort. PI: Jose Barreto, Department of Chemistry.

Co-Investigator on $1.2M funded DOD/ONR grant lead by S. Isern (PI, FGCU Biotechnology; J. Barreto, Sub-project leader) entitled "Mechanistic Studies of Flavivirus Inhibition and Nanoparticle-Catalyzed Decontamination". Leader of tasks in this grant focused on electrical characterization of visible and UV light induced decontamination of surface contaminants. DTRA-10-1-0009. Spring 2010 to Summer 2012.

Co-Investigator on $484,120 DTRA/ONR grant "Detoxification and Detection of Natural Toxins to Defend Against a Potential Bio-Weapon Attack". ONR N00178-09-C-3009. August 2009 to December, 2010. Leader of tasks involving electrical characterization of materials for dual sensing-detoxification. PI: Jose Barreto, Department of Chemistry, FGCU.

PI in previously funded Grants:

"Development of a system for acquisition and storage of parameters associated to respiratory mechanics with the purpose of improving ventilatory assistance". Funded by COLCIENCIAS, Colombia, 2005. **PI**.

"Development of a method for ambulatory monitoring of pressure peaks on the insensible foot and for patient warning aimed at the prevention of plantar ulcers". Funded by COLCIENCIAS, Colombia, 2003. **PI**.

Participant in other previously funded Grants:

Co-investigator. Grant: "Spatially selective coagulation of hypervascular lesions". PI: Bahman Anvari. Funded by NIH, 2001.

Co-investigator. Grant: "Mechanics of cochlear outer hair cell". PI: William E. Brownell, Baylor College of Medicine. Funded by NIH, 2001.

HONORS:
Fulbright Scholar for engineering studies in the U.S.A. Honors Graduate from medical school.